WLS-IFC

USB-To-Wireless Interface Module

User's Guide

MEASUREMENT COMPUTING™

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USB-to-Wireless Interface Module

User's Guide

MEASUREMENT COMPUTING™

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About this User's Guide

What you will learn from this user's guide

This user's guide explains how to install, configure, and use the WLS-IFC. This user's guide also refers you to related documents available on our web site, and to technical support resources.

Conventions in this user's guide

For more information on …

Text presented in a box signifies additional information and helpful hints related to the subject matter you are reading.

Caution! Shaded caution statements present information to help you avoid injuring yourself and others, damaging your hardware, or losing your data.

<#:#> Angle brackets that enclose numbers separated by a colon signify a range of numbers, such as those assigned to registers, bit settings, etc.

bold text **Bold** text is used for the names of objects on the screen, such as buttons, text boxes, and check boxes. For example:
1. Insert the disk or CD and click the **OK** button.

italic text *Italic* text is used for the names of manuals and help topic titles, and to emphasize a word or phrase. For example:
The *Insta*Cal installation procedure is explained in the *Quick Start Guide*.
Never touch the exposed pins or circuit connections on the board.

Where to find more information

The following electronic documents provide helpful information relevant to the operation of the WLS-IFC.

- MCC's *Specifications: WLS-IFC* (the PDF version of the *Specifications* chapter in this guide) is available on our web site at www.mccdaq.com/pdfs/WLS-IFC.pdf.
- MCC's *Quick Start Guide* is available on our web site at www.mccdaq.com/PDFmanuals/DAQ-Software-Quick-Start.pdf.
- MCC's *Guide to Signal Connections* is available on our web site at www.mccdaq.com/signals/signals.pdf.
- MCC's *Universal Library User's Guide* is available on our web site at www.mccdaq.com/PDFmanuals/sm-ul-user-guide.pdf.
- MCC's *Universal Library Function Reference* is available on our web site at www.mccdaq.com/PDFmanuals/sm-ul-functions.pdf.
- MCC's *Universal Library for LabVIEW™ User's Guide* is available on our web site at www.mccdaq.com/PDFmanuals/SM-UL-LabVIEW.pdf.

WLS-IFC User's Guide (this document) is also available on our web site at www.mccdaq.com/PDFmanuals/WLS-IFC.pdf.

Introducing the WLS-IFC

Overview: WLS-IFC features

This user's guide contains all of the information you need to configure the WLS-IFC for wireless operation with remote WLS-Series devices.

The WLS-IFC is a USB-to-wireless interface module that is supported under popular Microsoft® Windows® operating systems. The WLS-IFC is fully compatible with both USB 1.1 and USB 2.0 ports.

The WLS-IFC device operates as the interface between a computer and one or more remote WLS-Series devices. The remote devices can be located up to 150 feet (50 meters) indoors, or up to ½ mile (750 m) outdoors from the WLS-IFC.

You configure the network parameters required for communication with remote devices. All parameters are software selectable. Only devices with the same parameter settings can communicate with each other. Once you configure the WLS-IFC to communicate with remote devices, you can connect it to different computers without having to configure the network parameters.

The WLS-IFC has LEDs that indicate the status of communication over the wireless link. An LED bar graph shows the fade margin of signals received by the WLS-IFC.

The WLS-IFC is a standalone plug-and-play device which draws power through the USB cable. No external power is required. All configurable options are software programmable.

WLS-IFC block diagram

WLS-IFC functions are illustrated in the block diagram shown here. The diagram shows the WLS-IFC communicating with three remote WLS devices. There is no limit to the number of WLS devices that the WLS-IFC can communicate with.

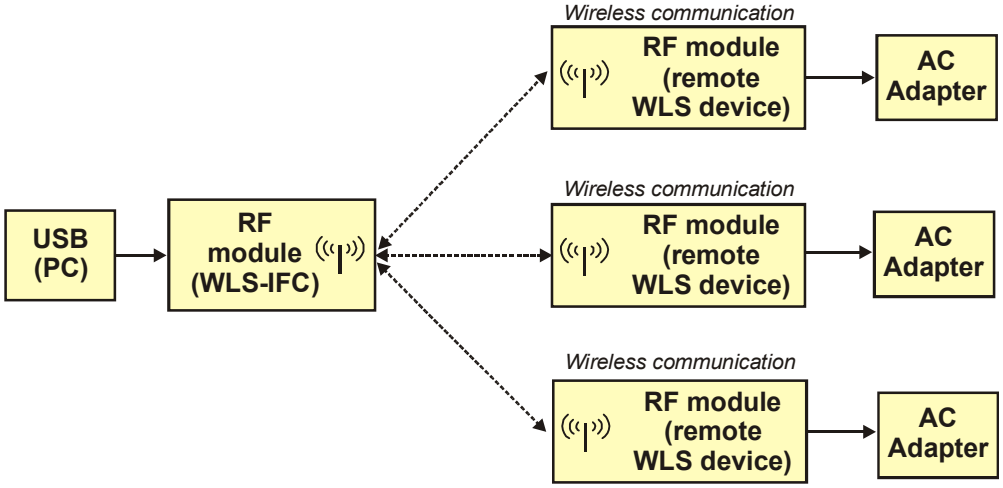


Figure 1. WLS-IFC functional block diagram

Software features

For information on the features of *Insta*Cal and the other software included with your WLS-IFC, refer to the *Quick Start Guide* that shipped with your device. The *Quick Start Guide* is also available in PDF at www.mccdaq.com/PDFmanuals/DAQ-Software-Quick-Start.pdf.

Check www.mccdaq.com/download.htm for the latest software version.

Installing the WLS-IFC

What comes with your WLS-IFC shipment?

The following items are shipped with the WLS-IFC.

Hardware

- WLS-IFC

- USB cable (2 meter length)

Additional documentation

In addition to this hardware user's guide, you should also receive the *Quick Start Guide* (available in PDF at www.mccdaq.com/PDFmanuals/DAQ-Software-Quick-Start.pdf). This booklet supplies a brief description of the software you received with your WLS-IFC and information regarding installation of that software. Please read this booklet completely before installing any software or hardware.

Unpacking the WLS-IFC

As with any electronic device, you should take care while handling to avoid damage from static electricity. Before removing the WLS-IFC from its packaging, ground yourself using a wrist strap or by simply touching the computer chassis or other grounded object to eliminate any stored static charge.

If your WLS-IFC is damaged, notify Measurement Computing Corporation immediately by phone, fax, or e-mail. For international customers, contact your local distributor where you purchased the WLS-IFC.

- Phone: 508-946-5100 and follow the instructions for reaching Tech Support.
- Fax: 508-946-9500 to the attention of Tech Support
- Email: techsupport@mccdaq.com

Installing the software

Refer to the *Quick Start Guide* for instructions on installing the software on the *Measurement Computing Data Acquisition Software CD*. This booklet is available in PDF at www.mccdaq.com/PDFmanuals/DAQ-Software-Quick-Start.pdf.

Installing the WLS-IFC

Install the MCC DAQ software before you install the WLS-IFC

The driver needed to run your board is installed with the MCC DAQ software. Therefore, you need to install the MCC DAQ software before you install your board. Refer to the *Quick Start Guide* for instructions on installing the software.

To connect the WLS-IFC to your system, do the following:

1. Turn your computer on, and connect the USB cable to a USB port on your computer or to an external USB hub that is connected to your computer. The USB cable provides power and communication to the WLS-IFC.

Always connect an external hub to its power supply

If you are using a hybrid hub (one that can operate in either self-powered or bus-powered mode), always connect it to its external power supply.

If you use a hub of this type without connecting to external power, communication errors may occur that could result in corrupt configuration information on your wireless device. You can restore the factory default configuration settings with *Insta*Cal.

When you connect the WLS-IFC for the first time, a **Found New Hardware** popup balloon (Windows XP) or dialog (Windows 2000) opens as the WLS-IFC is detected.

After your system detects new hardware, the **Found New Hardware Wizard** opens and prompts you to respond to the question "*Can Windows connect to Windows Update to search for software?*"

2. Click on the **No, not this time** option, and then click on the **Next** button.

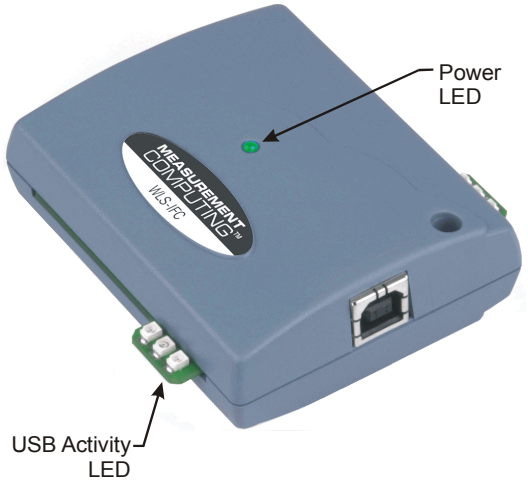
   The next dialog prompts you for the location of the software required to run the new hardware.

3. Keep the default selection "*Install the software automatically*" and then click on the **Next** button.

   The wizard locates and installs the software on your computer for the WLS-IFC. A dialog appears when the wizard completes the installation.

4. Click on the **Finish** button to exit the **Found New Hardware Wizard**.

A balloon or dialog appears when the hardware is installed and ready to use. Both the **Power** LED and the **USB Activity** LED should flash, and then the **Power** LED should remain lit. This indicates that communication is established between the WLS-IFC and your computer, and that the device is receiving power.



If the Power LED turns off

If the Power LED is lit but then turns off, the computer has lost communication with the WLS-IFC. Disconnect the USB cable from the computer and then reconnect it. This should restore communication, and the Power LED should remain *on* after the device is configured.

Configuring the network parameters

The following network parameter options are programmable with *Insta*Cal.

- **Identifier**: Text that identifies the device (optional).
- **PAN (hex)**: The personal area network (PAN) ID assigned to the device.

  The PAN value is a number used to identify the remote device with which you want to communicate. The WLS-IFC can only communicate with a device whose PAN is set to the same value.

  Most users do not need to change the default value assigned to the device. However, you may want to assign a different PAN ID in the following situations:

  - You have multiple WLS Series devices, and do not want to allow communication between all of them. Set the PAN ID to the same value on each device that you want to communicate.
  - If other WLS Series devices are operating in the vicinity, you can avoid accidental changes to your device settings by changing the default PAN value.
- **CH**: The radio frequency (RF) channel number assigned to the device.

  The channel number is used to transmit and receive data over the wireless link. You may want to change the channel number in *Insta*Cal when another WLS Series device is already transmitting on that channel, or when noise is present on the channel.

  The table below lists each available channel and its corresponding transmission frequency.

RF Channel	Transmission Frequency (GHz)	RF Channel	Transmission Frequency (GHz)
12	2.410	18	2.440
13	2.415	19	2.445
14	2.420	20	2.450
15	2.425	21	2.455
16	2.430	22	2.460
17	2.435	23	2.465

- **AES Key**: Value used to encrypt data (optional).

  AES encryption is disabled by default. Unless you suspect that there are other users of WLS Series devices in the area, there should be no need to enable encryption. However, if you suspect that there are other WLS Series devices in the area, and you need to secure the devices from being accessed by other users, enable AES encryption.

  Enabling encryption does NOT secure the device from access through a local USB connection. A remote device configured for encryption can be connected locally through the USB port to access other remote WLS Series devices with the same settings; you may need to physically secure the remote devices to prevent tampering of the of device's network.

Set the PAN ID, RF channel, and AES key to the same value for each device that you want to communicate

Only devices with matching parameter settings for PAN, CH, and AES Key (if set) can communicate with each other.
For information on setting up the network parameters for your WLS-IFC, refer to the "WLS Series" section of the "Temperature Input Boards" chapter in the *Universal Library User's Guide*.

You only have to set up the network parameters once. The WLS-IFC retains the parameter settings even if you connect to a different computer.

Caution! To satisfy FCC RF exposure requirements for mobile transmitting devices, maintain a separation distance of 20 cm (0.66 feet) or more between the antenna of this device and persons during device operation. To ensure compliance, operations at closer than this distance are not recommended. The antenna used for this transmitter must not be co-located in conjunction with any other antenna or transmitter.

Restoring factory default settings

You can restore the factory default configuration settings with *Insta*Cal.

Functional Details

External components

The WLS-IFC has the following external components, as shown in Figure 2.

- Status LEDs (USB Activity, Transmit, Receive, Received Signal Strength indicators)
- Power LED
- USB connector

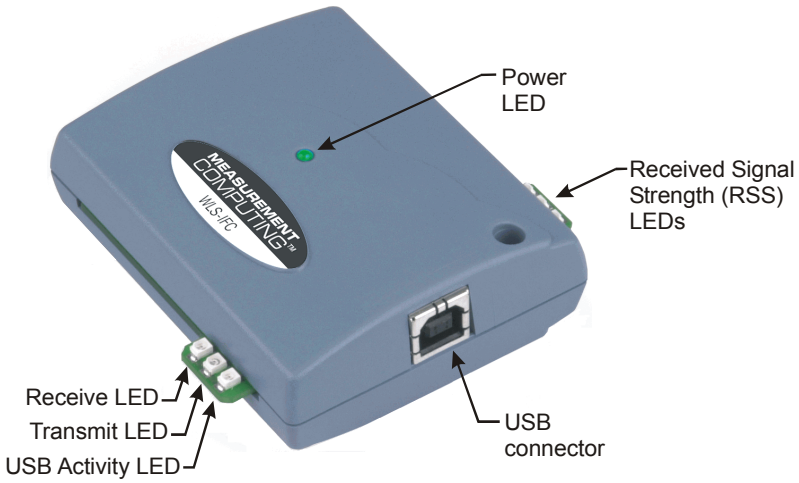


Figure 2. WLS-IFC component locations

Status LEDs

The LEDs indicate the communication status of USB and wireless operations. An LED bar graph indicates the strength of the signal received by the remote device. Refer to the table below for the function of each LED.

LED functions

LED	Function
Power	Steady green – the WLS-IFC is connected to a computer or external USB hub.
	Blinking green – indicates activity over the USB connection.
Received Signal Strength (RSS) indicators	3 green LED bar graph. The LEDs will turn on when receiving a wireless message and stay on for approximately 1 second after the end of the message. They indicate the amount of fade margin present in an active wireless link. Fade margin is defined as the difference between the incoming signal strength and the device's receiver sensitivity. ▪ Three LEDs on : Very strong signal (> 30 dB fade margin) ▪ Two LEDs on : Strong signal (> 20 dB fade margin) ▪ One LED on : Moderate signal (> 10 dB fade margin) ▪ No LEDs on: Weak signal (< 10 dB fade margin)
USB activity	Green LED – indicates activity over the USB connection.
Transmit	Yellow LED – indicates transmitting data over the wireless link.
Receive	Red LED – indicates receiving data over the wireless link.

Power LED

The **Power** LED is lit when the WLS-IFC is connected to a computer or external USB hub.

USB connector

The USB connector provides +5V power and communication.

Specifications

Typical for 25 °C unless otherwise specified.
Specifications in *italic* text are guaranteed by design.

Wireless communications

Table 1. Wireless communications specifications

Communication standard	*IEEE 802.15.4, ISM 2.4 GHz frequency band, non-beacon, point-to-point*
Range	Indoor/urban: Up to 150' (50 m) Outdoor RF line-of-sight: Up to 1/2 mile (750 m)
Transmit power output	10 mW (10 dBm)
Receiver sensitivity	*-100 dBm (1% packet error rate)*
RF channels	*12 direct sequence channels available, channels 12 – 23 (2.410 – 2.465 GHz) (software selectable)*
Addressing	16-bit PAN (personal area network) IDs per channel (software selectable) 64-bit device address
Encryption	*128-bit AES (software selectable)*

Note 1: Contains FCC ID: OUR-XBEEPRO. The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (*i.*) this device may not cause harmful interference and (*ii.*) this device must accept any interference received, including interference that may cause undesired operation.

Note 2: Canada: Contains Model XBee-PRO Radio, IC: 4214A-XBEEPRO

Caution! To satisfy FCC RF exposure requirements for mobile transmitting devices, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operations at closer than this distance is not recommended. The antenna used for this transmitter must not be co-located in conjunction with any other antenna or transmitter.

Memory

Table 2. Memory specifications

EEPROM	256 bytes USB micro for external application use

Microcontroller

Table 3. Microcontroller specifications

Type	High performance 8-bit RISC microcontroller

USB +5V voltage

Table 4. USB +5V voltage specifications

Parameter	Conditions	Specification
USB +5V (VBUS) input voltage range		4.75 V min. to 5.25 V max.

Power

Table 5. Power specifications

Parameter	Conditions	Specification
Supply current		300 mA max (Note 3)

Note 3: Self-Powered Hub refers to a USB hub with an external power supply. Self-powered hubs allow a connected USB device to draw up to 500 mA. This device may not be used with bus-powered hubs due to the power supply requirements.

Root Port Hubs reside in the PC's USB Host Controller. The USB port(s) on your PC are root port hubs. All externally powered root port hubs (desktop PC's) provide up to 500 mA of current for a USB device. Battery-powered root port hubs provide 100 mA or 500 mA, depending upon the manufacturer. A laptop PC that is not connected to an external power adapter is an example of a battery-powered root port hub.

USB specifications

Table 6. USB specifications

USB device type	USB 2.0 (full-speed)
Device compatibility	USB 1.1, USB 2.0
	Bus powered, 300 mA consumption max
USB cable type	*A-B cable, UL type AWM 2725 or equivalent. (min 24 AWG VBUS/GND, min 28 AWG D+/D-)*
USB cable length	3 meters max.

Environmental

Table 7. Environmental specifications

Operating temperature range	0 to 70 ° C
Storage temperature range	-40 to 85 ° C
Humidity	0 to 90% non-condensing

Mechanical

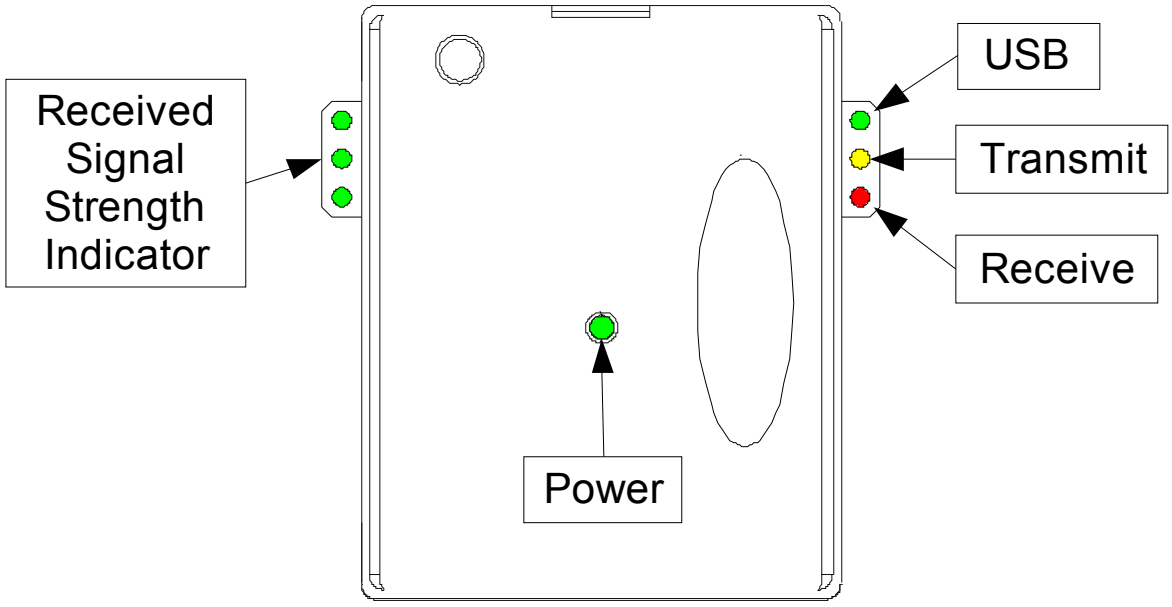
Table 8. Mechanical specifications

Dimensions	79 mm (L) x 75 mm (W) x 26.5 mm (H)

LED configuration

Table 9. LED configuration

Power	The WLS-IFC is connected to a computer or external USB hub
Received Signal Strength Indicator (RSSI)	3 green LED bar graph. The LEDs will turn on when receiving a wireless message and stay on for approximately 1 second after the end of the message. They indicate the amount of fade margin present in an active wireless link. Fade margin is defined as the difference between the incoming signal strength and the device's receiver sensitivity. ▪ 3 LEDs on: Very strong signal (> 30 dB fade margin) ▪ 2 LEDs on: Strong signal (> 20 dB fade margin) ▪ 1 LED on: Moderate signal (> 10 dB fade margin) ▪ 0 LEDs on: Weak signal (< 10 dB fade margin)
USB activity	Green LED – indicates activity over the USB connection
Transmit	Yellow LED – indicates transmitting data over the wireless link
Receive	Red LED – indicates receiving data over the wireless link



CE Declaration of Conformity

Manufacturer: Measurement Computing Corporation
Address: 10 Commerce Way
Suite 1008
Norton, MA 02766
USA

Category: Electrical equipment for measurement, control and laboratory use.

Measurement Computing Corporation declares under sole responsibility that the product

WLS-IFC

to which this declaration relates is in conformity with the relevant provisions of the following standards or other documents:

EU EMC Directive 89/336/EEC: Electromagnetic Compatibility, EN 61326 (1997) Amendment 1 (1998)

Emissions: Group 1, Class B

- EN 55011 (1990)/CISPR 11: Radiated and Conducted emissions.

Immunity: EN61326, Annex A

- IEC 61000-4-2 (1995): Electrostatic Discharge immunity, Criteria C.
- IEC 61000-4-3 (1995): Radiated Electromagnetic Field immunity Criteria A.
- IEC 61000-4-8 (1994): Power Frequency Magnetic Field immunity Criteria A.

ETSI EN301 489-1 (2004)
IEC 61000-3-2 (2001) Harmonic Current Emissions, IEC 61000-3-3 (2003) Voltage Fluctuations and Flicker

Emissions: Group 1, Class B

- CISPR 22 (2004): Radiated and Conducted Electromagnetic Emissions (USB cable with ferrite suppressor assembly required).
- IEC 61000-3-2 (2001): Harmonic Emissions Class A
- IEC 61000-3-3 (2003): Fluctuations and Flicker

Immunity:

- IEC 61000-4-2 (2001): Electrostatic Discharge immunity, Criteria C.
- IEC 61000-4-3 (2002): Radiated Electromagnetic Field immunity Criteria A.
- IEC 61000-4-4 (2004): Electric fast transient burst immunity Criteria B.
- IEC 61000-4-5: Fast surge immunity Criteria B
- IEC 61000-4-6 (2003): Radio Frequency Common Mode immunity Criteria B*.
- IEC 61000-4-11 (2004): Voltage dips and interrupt immunity Criteria B

* There may be a loss of performance in the presence of an RF electromagnetic disturbance on the input/output ports. Performance loss will be limited to measured temperatures outside of specified accuracy. The transmitter / receiver will continue to operate as specified. Stored data and operating state will be maintained during the disturbance. Operation will recover to within specified limits after the disturbance is removed.

Declaration of Conformity based on tests conducted by Chomerics Test Services, Woburn, MA 01801, USA in November, 2006. Test records are outlined in Chomerics Test Report #EMI4660.06.

We hereby declare that the equipment specified conforms to the above Directives and Standards.

Carl Haapaoja, Director of Quality Assurance

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